IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

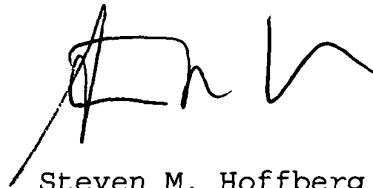|		
Applicant(s)	:	Paul A. Nysen, et al.
Serial No.	:	To be assigned
Filed	:	Herewith
For	:	BACKSCATTER TRANSPONDER INTERROGATION DEVICE

August 20, 2003

Hon. Commissioner of Patents
   & Trademarks
Washington, DC 20231

Sir:

LETTER TO THE OFFICIAL DRAFTSMAN

Enclosed herewith are 23 sheets of formal drawings for the above referenced patent application. Approval of the formal aspects thereof is respectfully solicited.

Respectfully submitted,

Steven M. Hoffberg
Reg. No. 33,511

MILDE & HOFFBERG, LLP
10 Bank Street - Suite 460
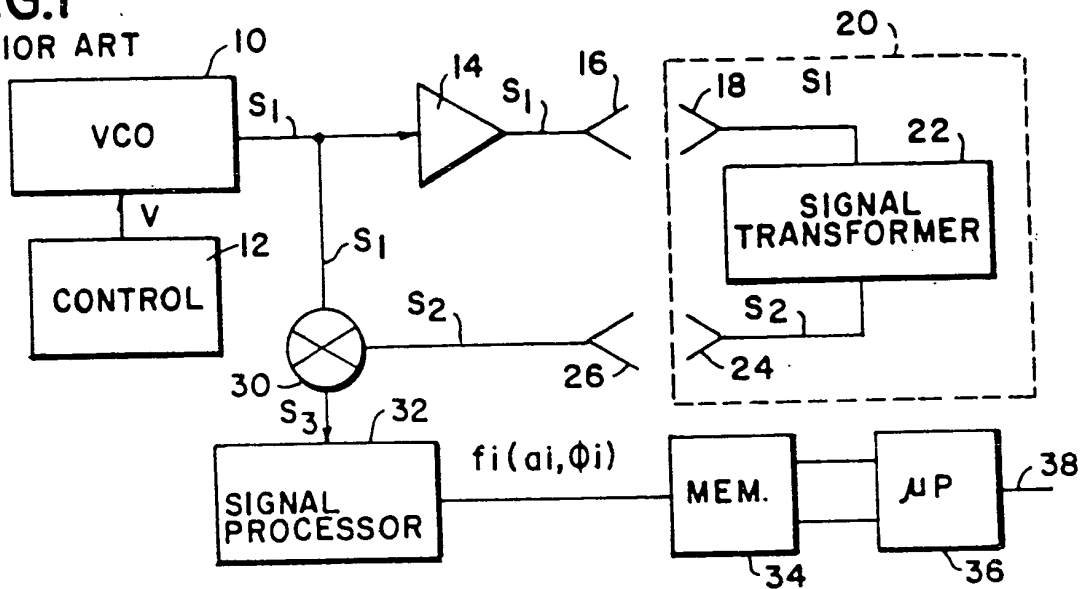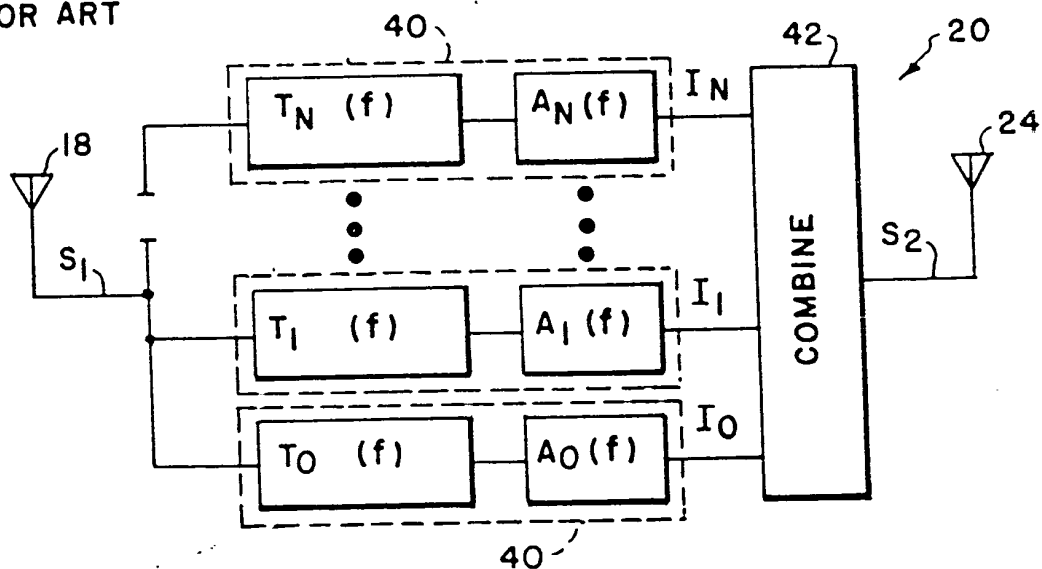White Plains, NY 10606
(914) 949-3100

FIG.1

10 — VCO

S_1

V

12 — CONTROL

14 — S_1

16

S_1

18 — 20

22 — SIGNAL TRANSFORMER

S_2

24 — 26

30 — S_2

S_3

32 — SIGNAL PROCESSOR

$f_i(a_i, \phi_i)$

MEM. — 34

μP — 38

36

FIG.2

40

$T_N(f)$ $A_N(f)$ I_N

42   20

18

S_1

$T_1(f)$ $A_1(f)$ I_1

COMBINE

24

S_2

$T_0(f)$ $A_0(f)$ I_0

40

FIG.3A

MHZ

925

915

905

44

t (ms)

|←16ms→|

.67
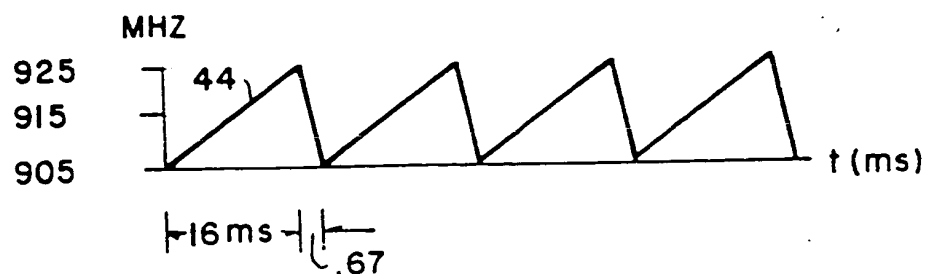
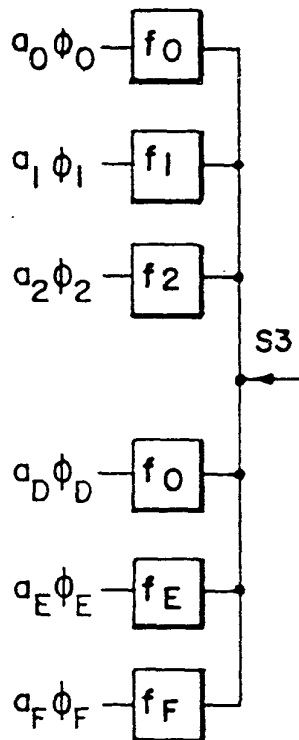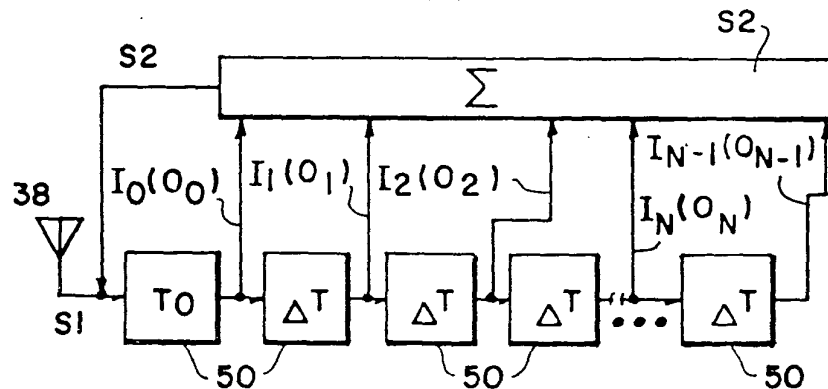## FIG.3B
PRIOR ART
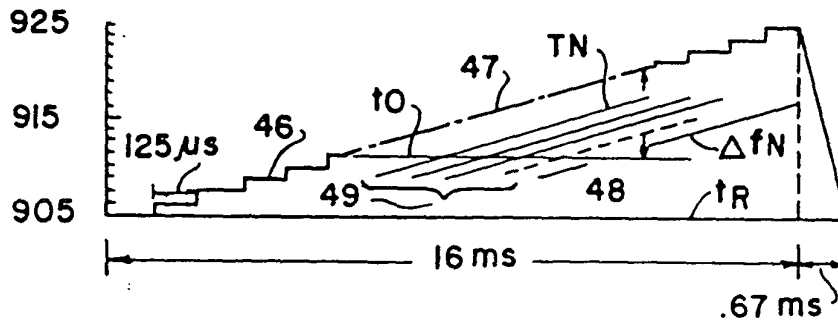
FIG.4
PRIOR ART
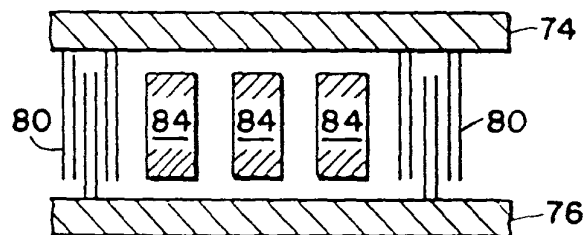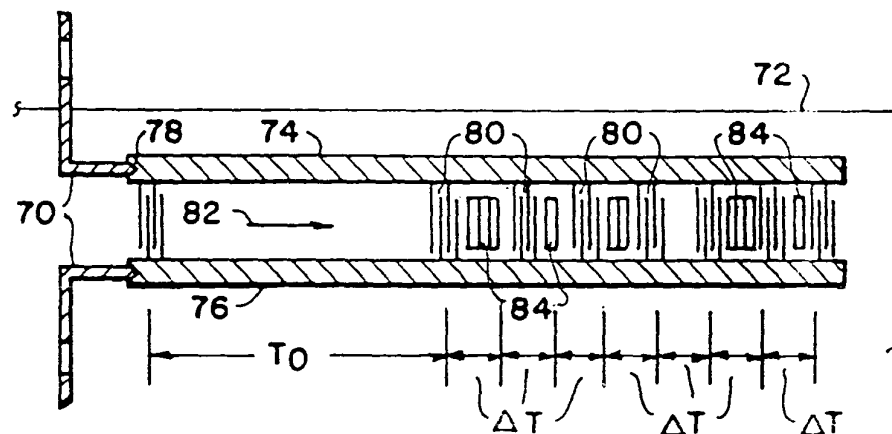

FIG.5
PRIOR ART

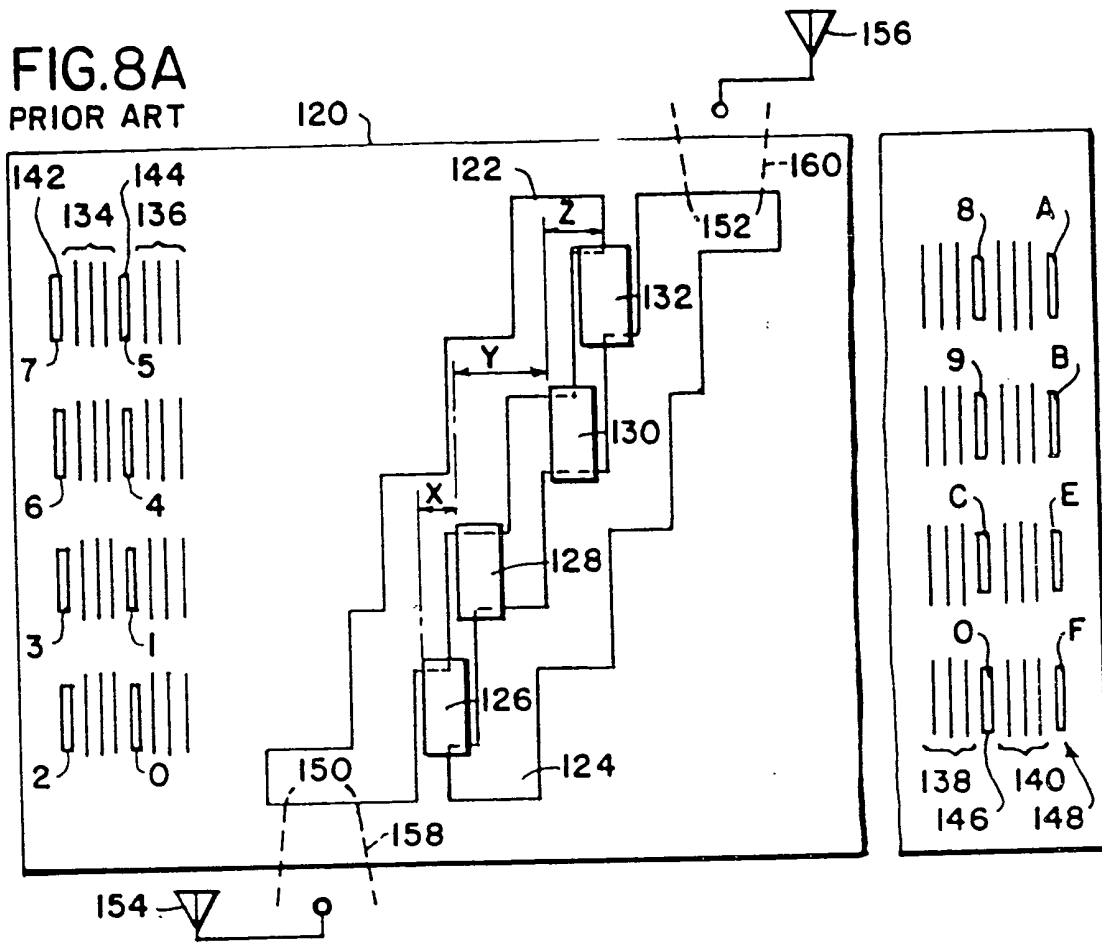## FIG.7
PRIOR ART

FIG.6
PRIOR ART

FIG.8A
PRIOR ART

120

122

156

160

152

132

Z

142 144
134 136

7 5

Y

130

6 4

X

128

3 1

126

2 0

150

124

158

154

8 A

9 B

C E

O F

138 140
146 148

FIG.8B
PRIOR ART

122

125

124

150
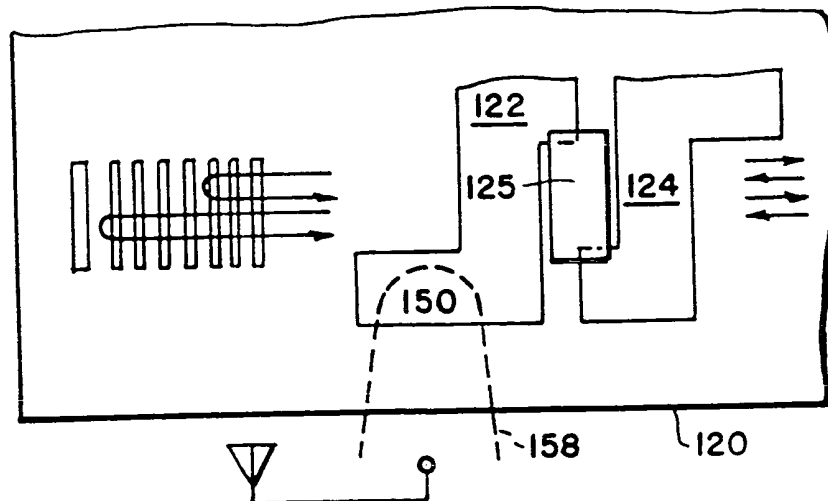
158

120

FIG.9A

Bↂ $\updownarrow$ ▭

←ΔT→

FIG.9B

Bx
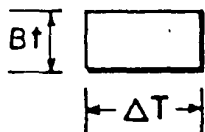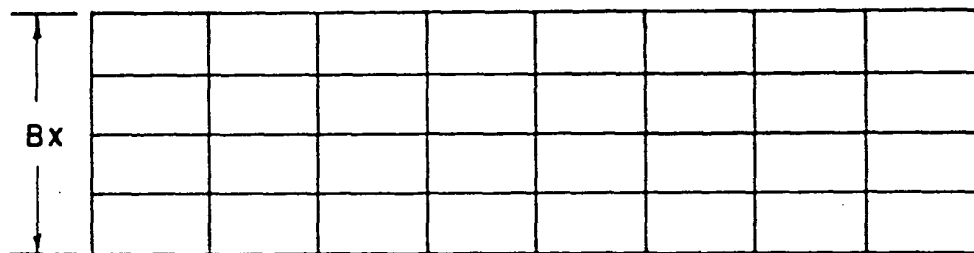
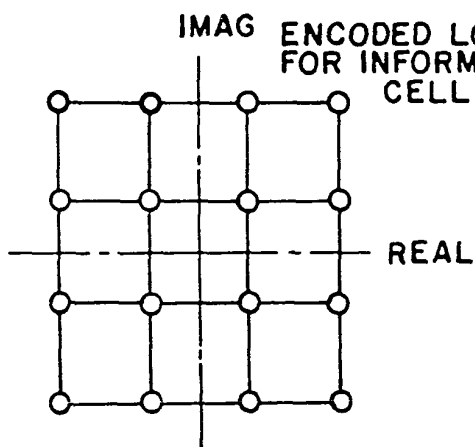Tf   INFORMATION CELL DISTRIBUTED OVER TIME   Tl
            AND FREQUENCY

FIG.9C

|← Tl−Tf →|

3μs   23μs

902MHz
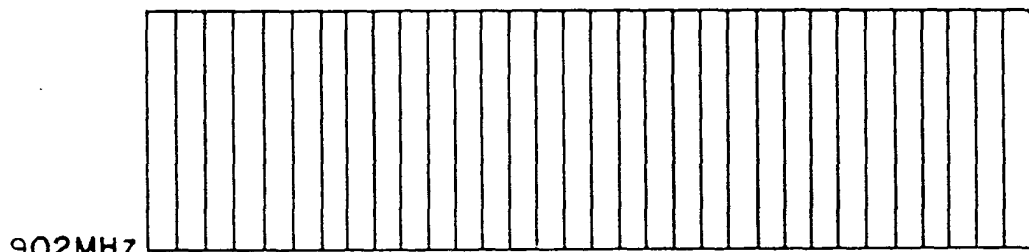
INFORMATION CELLS DISTRIBUTED OVER TIME ONLY

FIG.IOA

IMAG   ENCODED LOCATION
        FOR INFORMATION
        CELL

REAL

QAM (16) ENCODING
RECTANGULAR MODULATION

FIG.IOB

IMAG   ENCODED
        LOCATION
        FOR
        INFORMA
        -TION
        CELL

#1

REAL
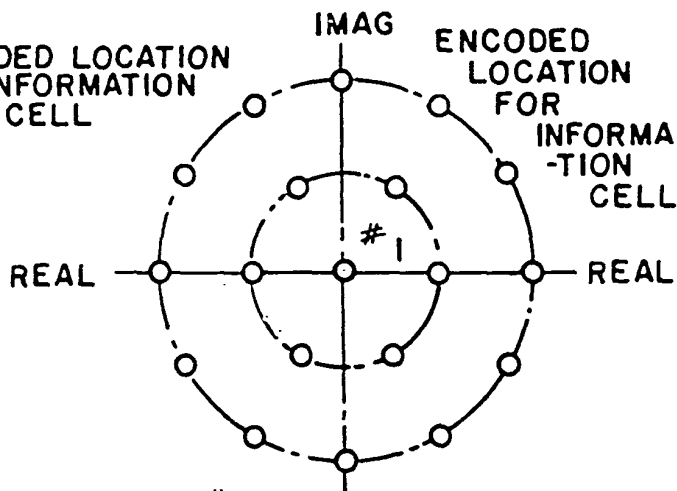
#1 CELL NOT USED
Q AM (18) ENCODING
POLAR MODULATION
(BETTER SUITED SAW APPLICATION)

FIG.11A

FIG.11B

POLARIZATION AXES
POLARIZATION COVERAGE

SPATIAL DISCRIMINA
-TION MULTI-READ
POINTS
SPATIAL COVERAGE

BEAM PATTERN COVERAGE USING PATCH
LIKE ANTENNA (PROJECTION VIEW)

FIG.11C

R = READERS

FIG.12A

RF PROCESSING

PULSE

1/T

T

FIG.12B

CHIRP

FIG.12C

CHIRP
IMPULSE   (AFTER WEIGHTING APPLIED)

T
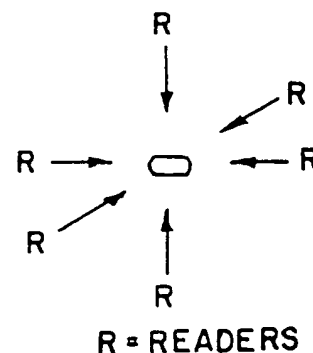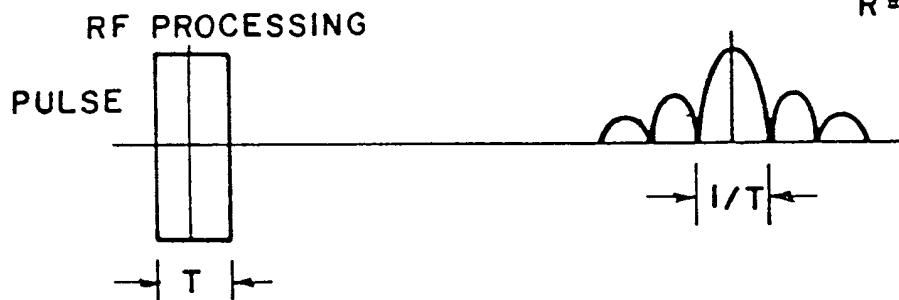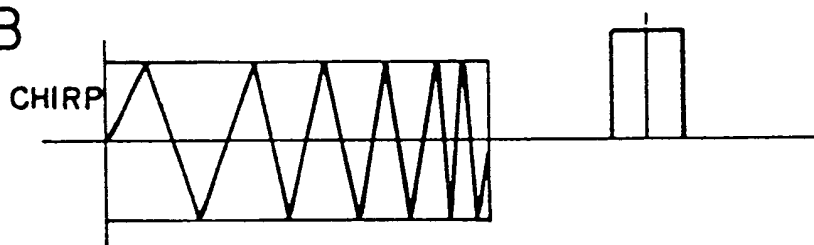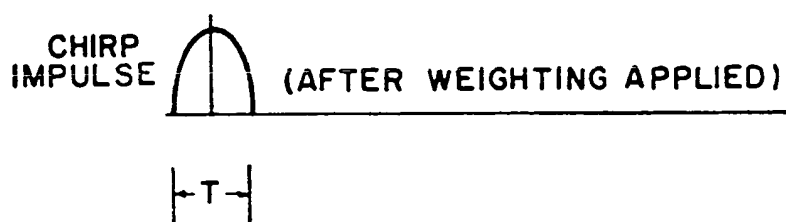
FIG.12D
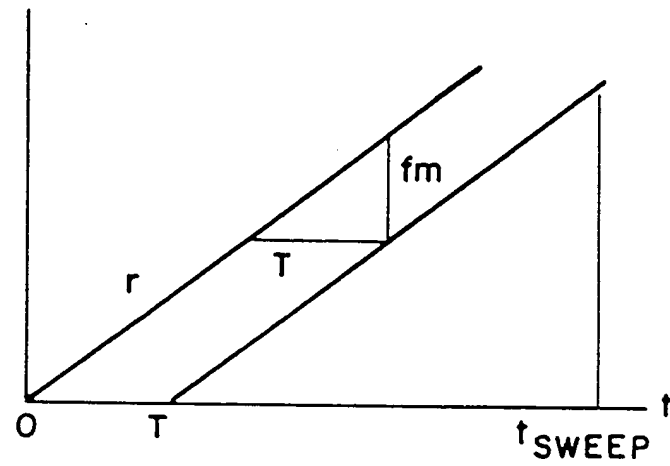
$$fm = Tr$$

t_{SWEEP} = SWEEP TIME

$1/t_{SWEEP}$ = NOISE BANDWIDTH OF DETECTOR

FIG.13
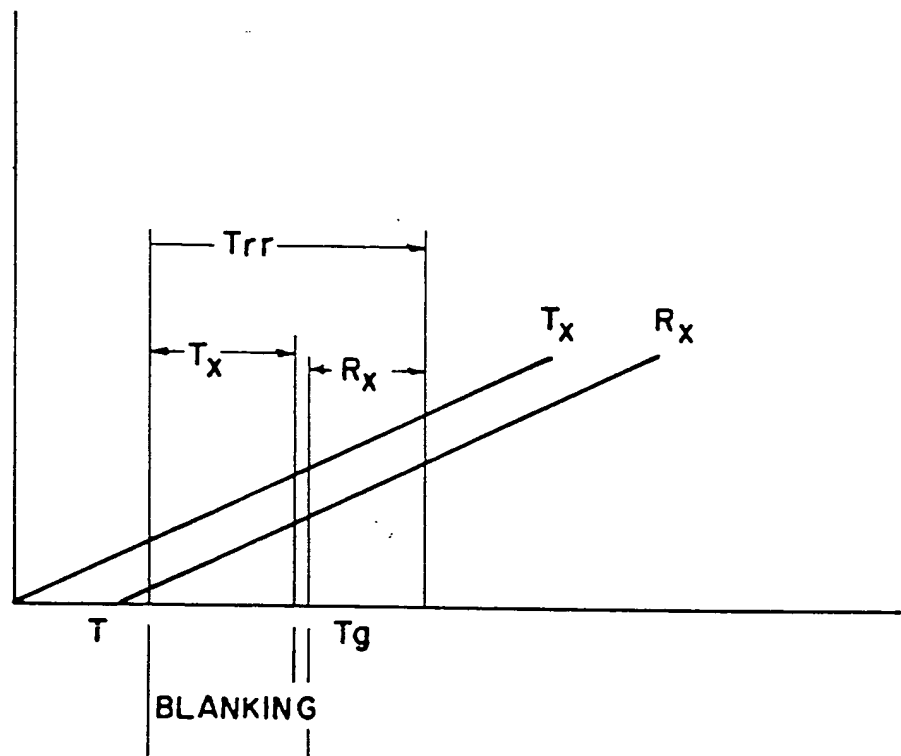
FIG.14
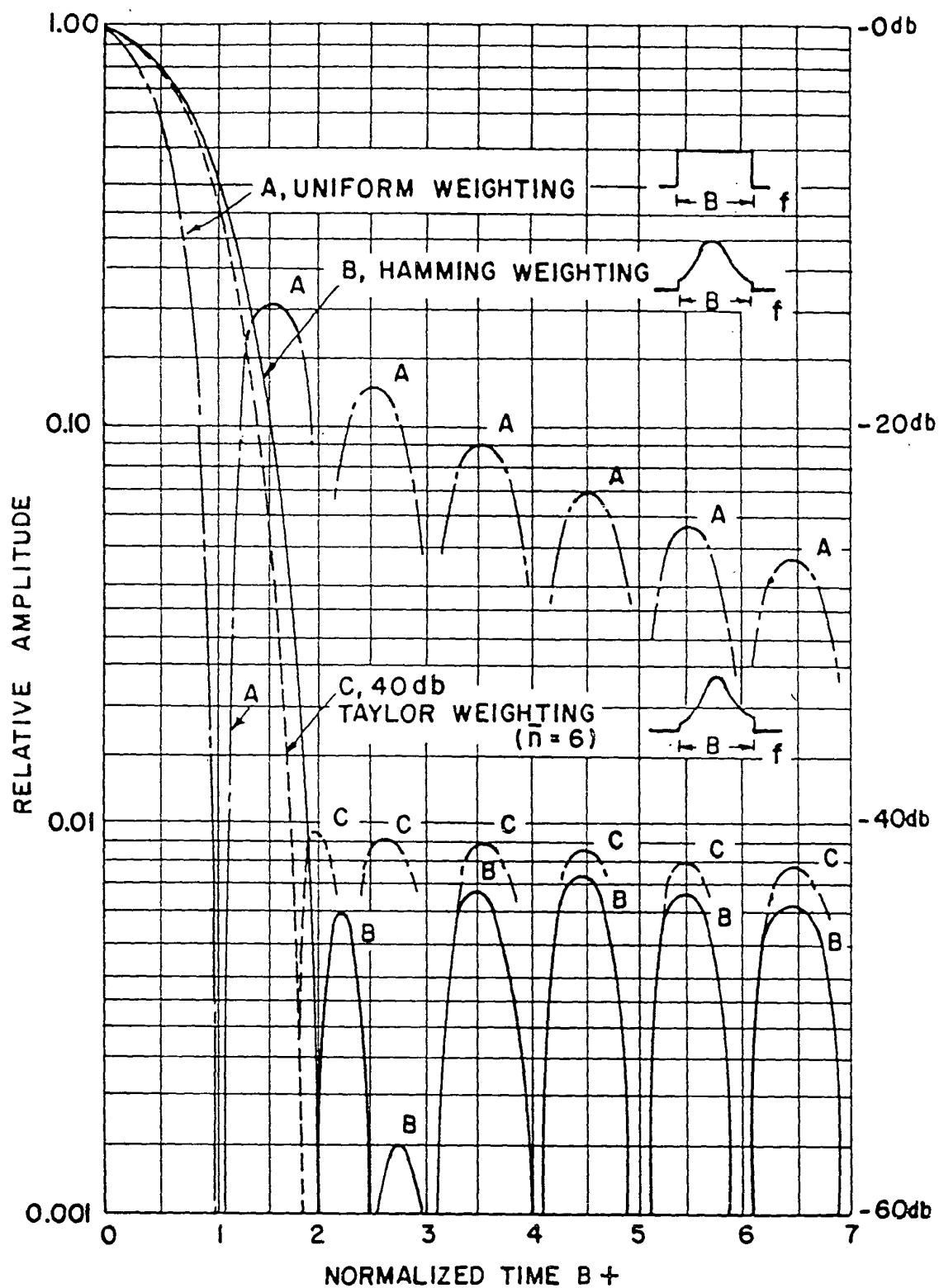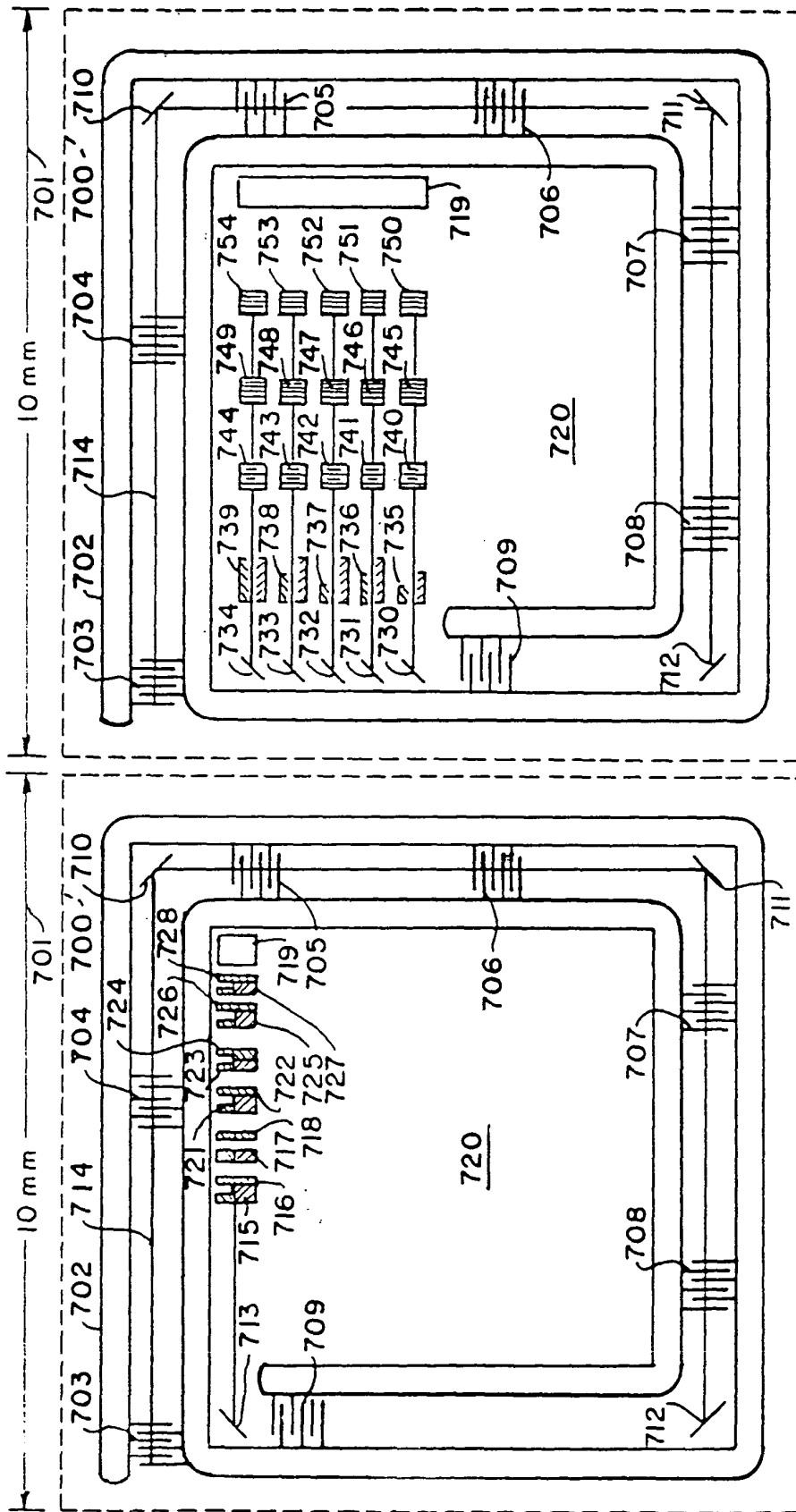
RELATIVE AMPLITUDE

NORMALIZED TIME B ⊹

A, UNIFORM WEIGHTING

B, HAMMING WEIGHTING

C, 40db
TAYLOR WEIGHTING
($\bar{n}=6$)

FIG.16

‖‖‖ TRANSDUCER SELECTED FOR 1 OF Nf FREQ. BANDS
／ HIGH EFFICIENCY CORNER REFLECTOR
／ PARTIAL 90 DEG. REFLECTOR
🗄 AMPLITUDE WEIGHTED DELAY PAD
▥ FREQUENCY SELECTIVE REFLECTOR

FIG.15

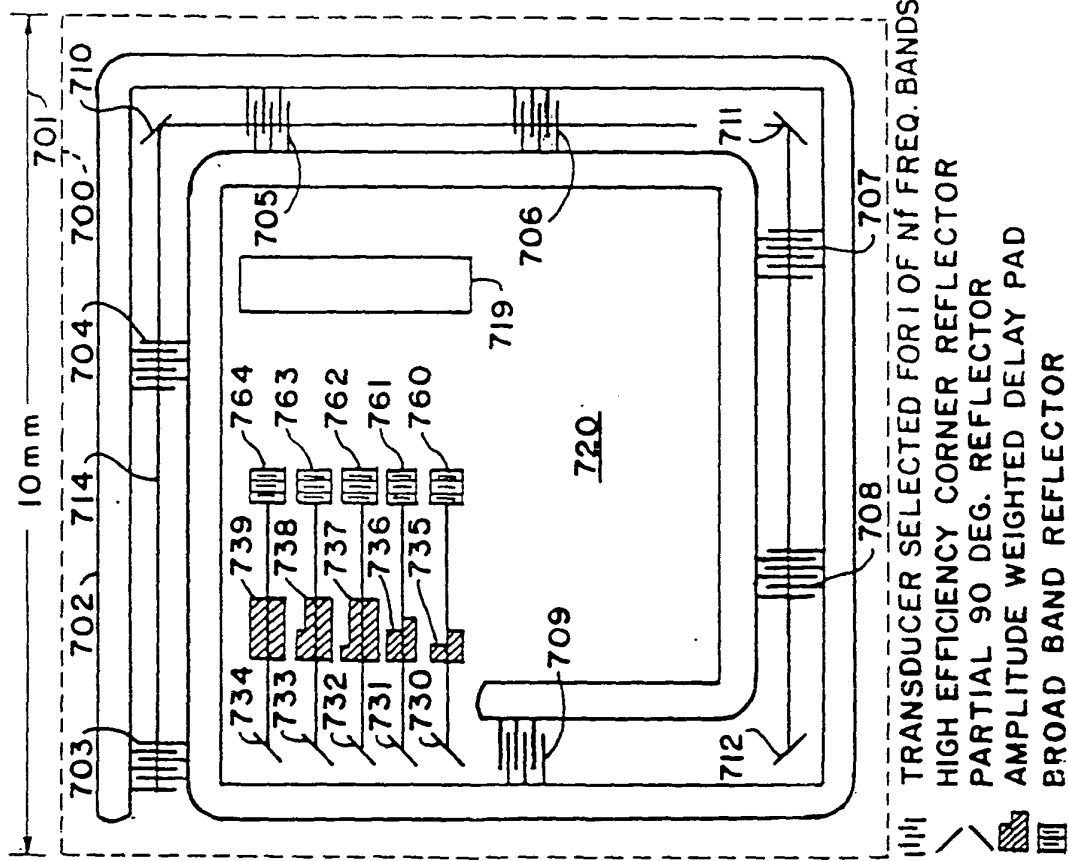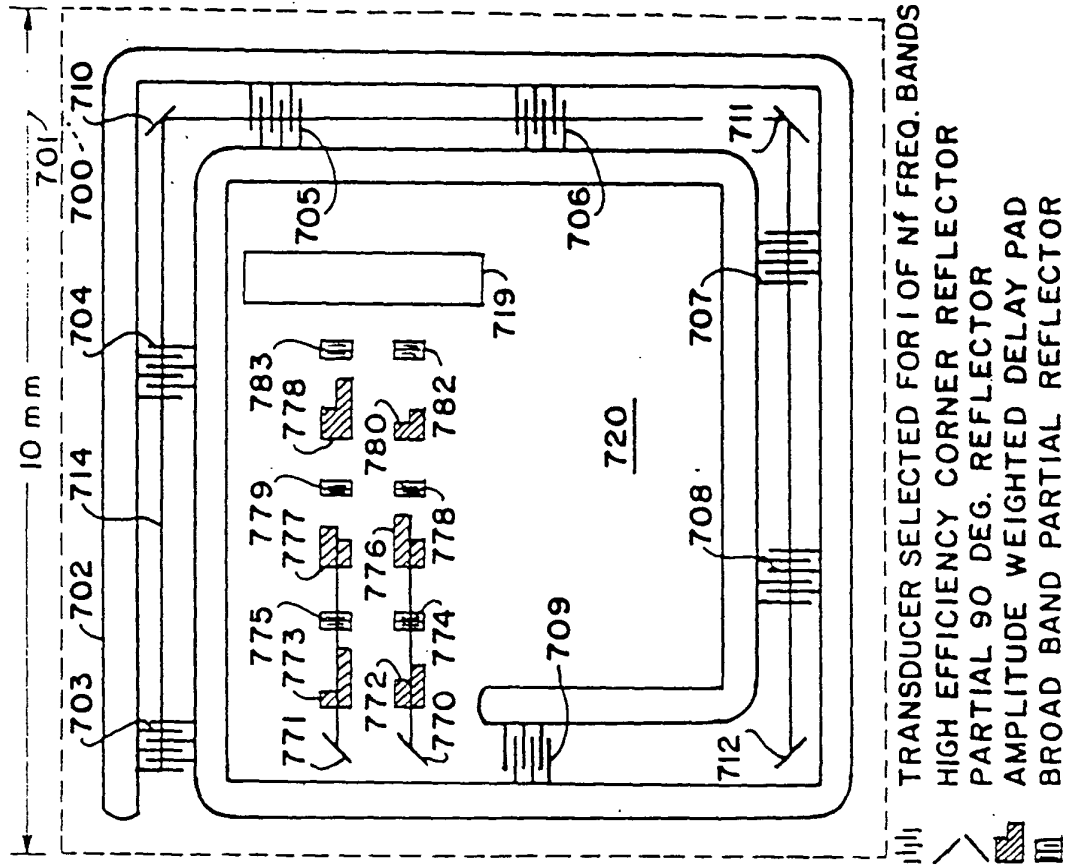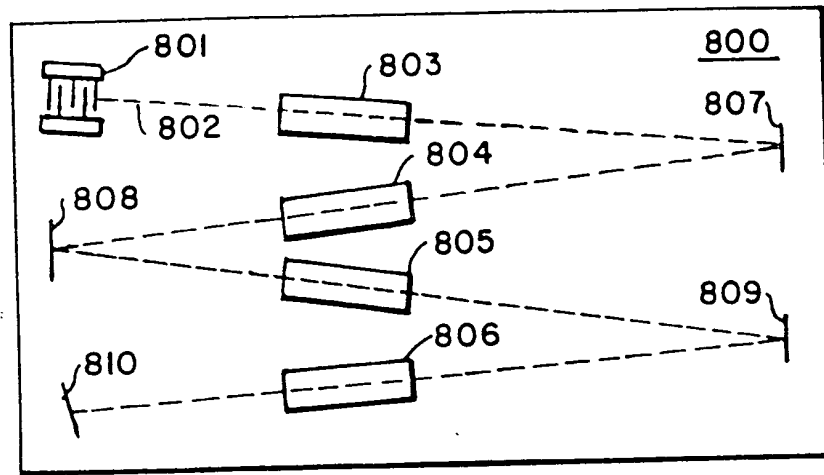‖‖‖ TRANSDUCER SELECTED FOR 1 OF Nf FREQ BANDS
／ HIGH EFFICIENCY CORNER REFLECTOR
🗄 AMPLITUDE WEIGHTED DELAY PAD
▯ BROAD BAND PARTIAL REFLECTOR

FIG.17

TRANSDUCER SELECTED FOR I OF Nf FREQ. BANDS
HIGH EFFICIENCY CORNER REFLECTOR
PARTIAL 90 DEG. REFLECTOR
AMPLITUDE WEIGHTED DELAY PAD
BROAD BAND REFLECTOR

FIG.18

TRANSDUCER SELECTED FOR I OF Nf FREQ. BANDS
HIGH EFFICIENCY CORNER REFLECTOR
PARTIAL 90 DEG. REFLECTOR
AMPLITUDE WEIGHTED DELAY PAD
BROAD BAND PARTIAL REFLECTOR

FIG.19A

801
802
803
800
804
807
808
805
809
810
806

FIG.19B

820
824
844
821
837
823
825
839
839
836
835
826
834
840
827
828
833
842
841
829
832
830
843
831

FIG.19C

851
855
864
853
850
860
858
862
857
863
861
859
854
852
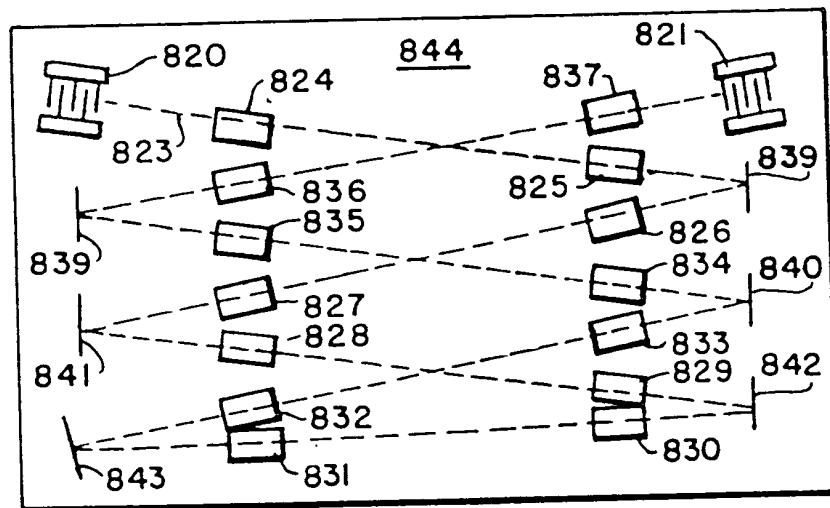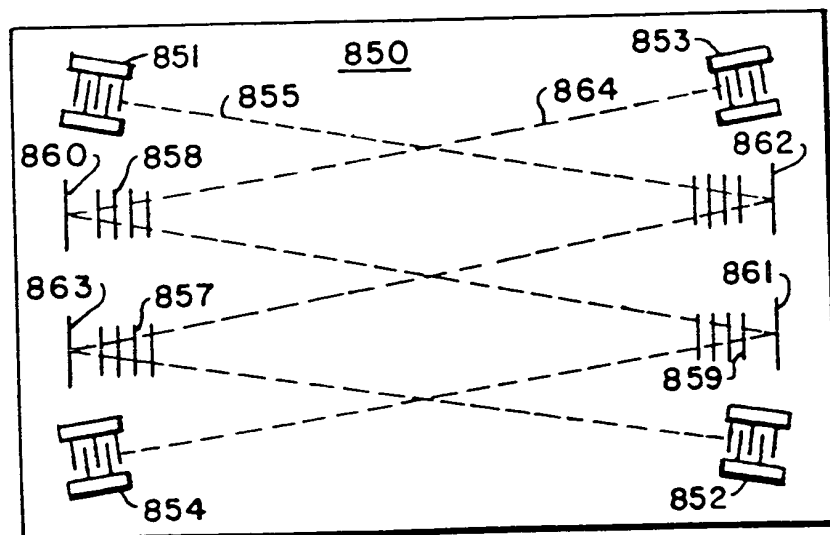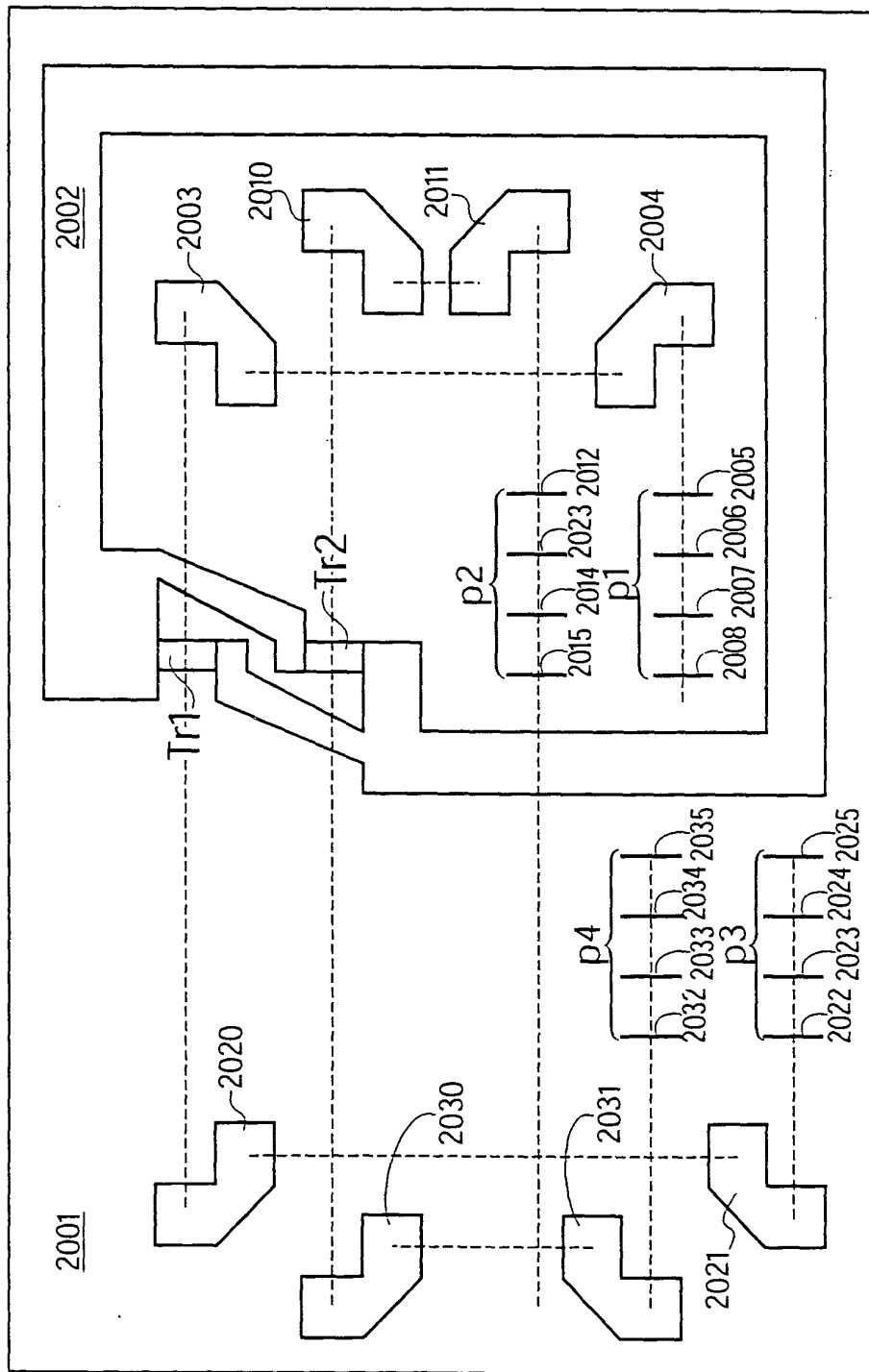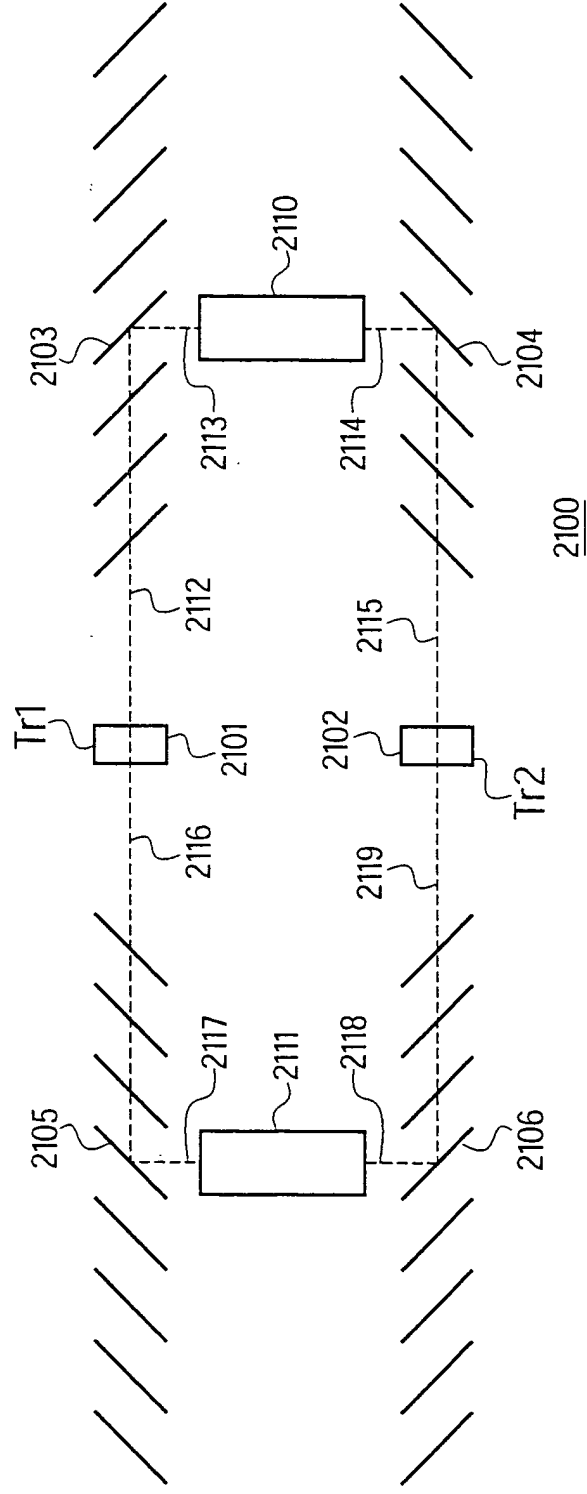
Fig. 20

Fig. 21

Calculation of element reflection and resultant loss per tap (excluding transducer loss) for 16 tap RAC. (8 taps on each side of transducers)
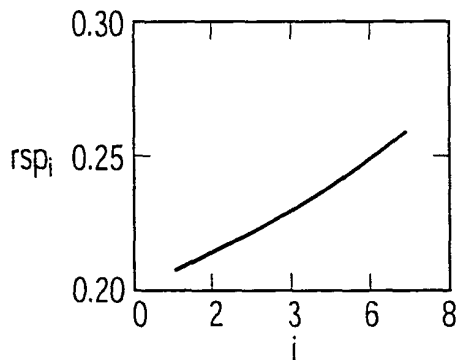
Parameters: top = prop. loss between taps (200ns delay)
rsp0 = refl. coeff. of 1st tap (one RAC element)
rl0 = prop. loss of first tap (1 μs delay)(dB)

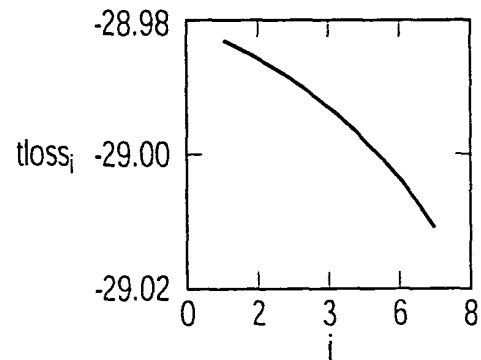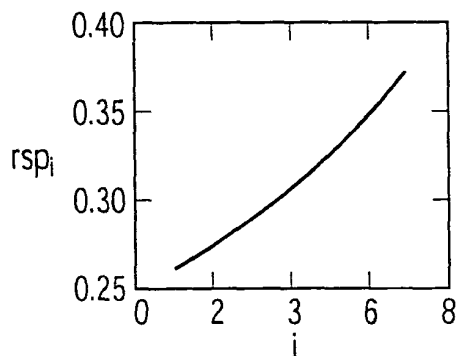$$top := 0.977 \qquad rp_0 = 0.04 \qquad rl_0 := 1.0 \qquad rsp_0 := \sqrt{rp_0}$$

$$i := 1..7 \qquad rp_i := \frac{rp_{i-1}}{1-rp_{i-1}} \cdot \frac{1}{top} \qquad rl_i := (1-rp_i) \cdot top \cdot \frac{rp_i}{rp_{i-1}} \qquad rsp_i := \sqrt{rp_i}$$

$$tloss_i := 20 \cdot \log(rl_i \cdot rp_0) - 1.0 \qquad tloss_0 := 20 \cdot \log(rp_0) - 1.0$$

$$rsp = \begin{bmatrix} 0.2 \\ 0.207 \\ 0.214 \\ 0.221 \\ 0.229 \\ 0.238 \\ 0.248 \\ 0.259 \end{bmatrix} \qquad rl = \begin{bmatrix} 1 \\ 0.997 \\ 0.997 \\ 0.997 \\ 0.996 \\ 0.996 \\ 0.995 \\ 0.994 \end{bmatrix} \qquad tloss = \begin{bmatrix} -28.959 \\ -28.983 \\ -28.986 \\ -28.989 \\ -28.993 \\ -28.998 \\ -29.004 \\ -29.011 \end{bmatrix}$$

element reflection as funct. of tap #

Transm. loss as funct. of tap #, dB

Fig. 22

Calculation of element reflection and resultant loss per tap (excluding transducer loss) for 16 tap RAC. (8 taps on each side of transducers)

Parameters: top = prop. loss between taps (200ns delay)
rsp0 = refl. coeff. of 1st tap (one RAC element)
rl0 = prop. loss of first tap (1 µs delay)(dB)

$$top := 0.977 \qquad rp_0 = 0.0625 \qquad rl_0 := 1.0 \qquad rsp_0 := \sqrt{rp_0}$$

$$i := 1.. 7 \qquad rp_i := \frac{rp_{i-1}}{1-rp_{i-1}} \cdot \frac{1}{top} \qquad rl_i := (1-rp_i) \cdot top \cdot \frac{rp_i}{rp_{i-1}} \qquad rsp_i := \sqrt{rp_i}$$

$$tloss_i := 20 \cdot \log(rl_i \cdot rp_0) - 1.0 \qquad tloss_0 := 20 \cdot \log(rp_0) - 1.0$$

$$rsp = \begin{bmatrix} 0.25 \\ 0.261 \\ 0.274 \\ 0.288 \\ 0.304 \\ 0.323 \\ 0.345 \\ 0.372 \end{bmatrix} \qquad rl = \begin{bmatrix} 1 \\ 0.994 \\ 0.993 \\ 0.991 \\ 0.989 \\ 0.987 \\ 0.983 \\ 0.978 \end{bmatrix} \qquad tloss = \begin{bmatrix} -25.082 \\ -25.136 \\ -25.145 \\ -25.158 \\ -25.174 \\ -25.197 \\ -25.228 \\ -25.275 \end{bmatrix}$$

element reflection as funct. of tap #

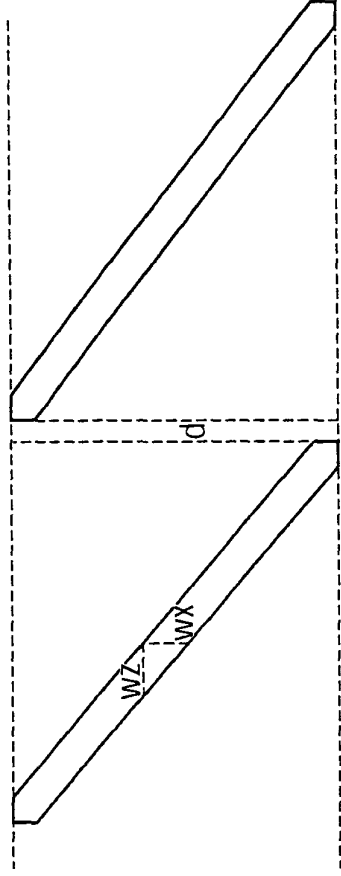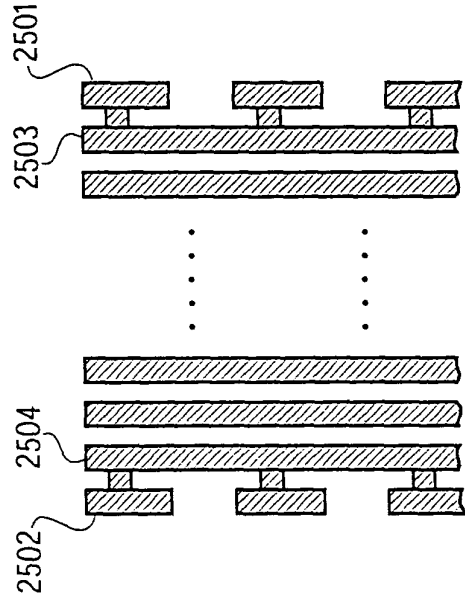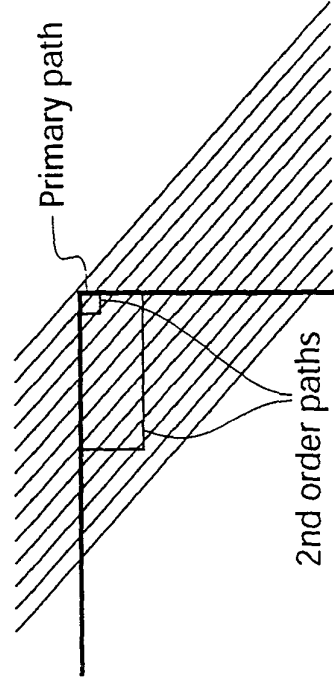Transm. loss as funct. of tap #, dB

Fig. 23

2501

2503

Fig. 25
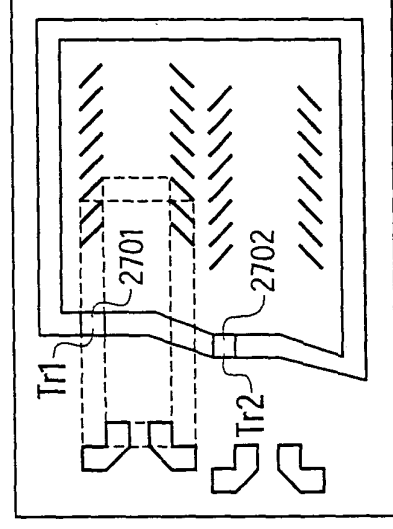
2504

2502

2701

Tr1

2702
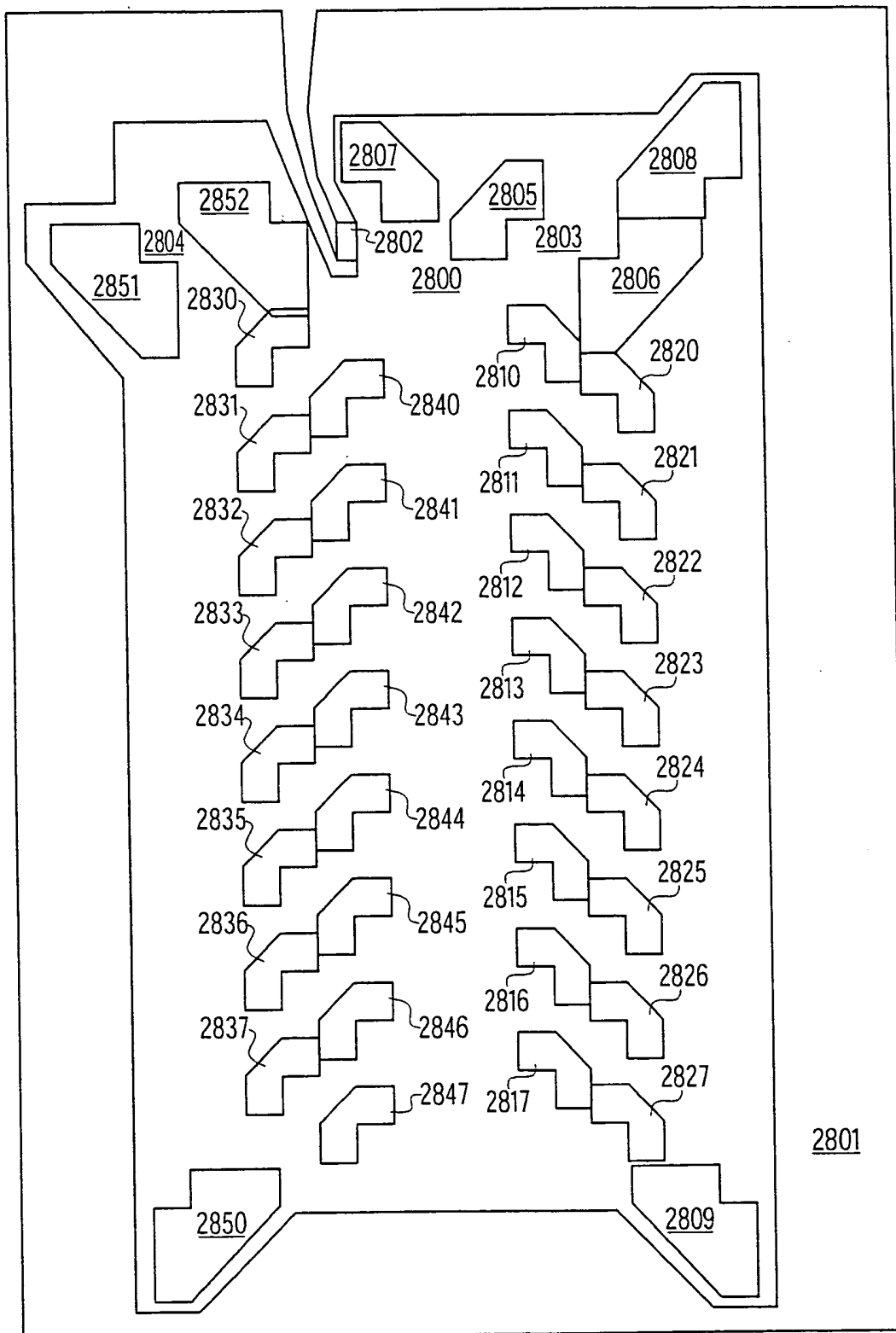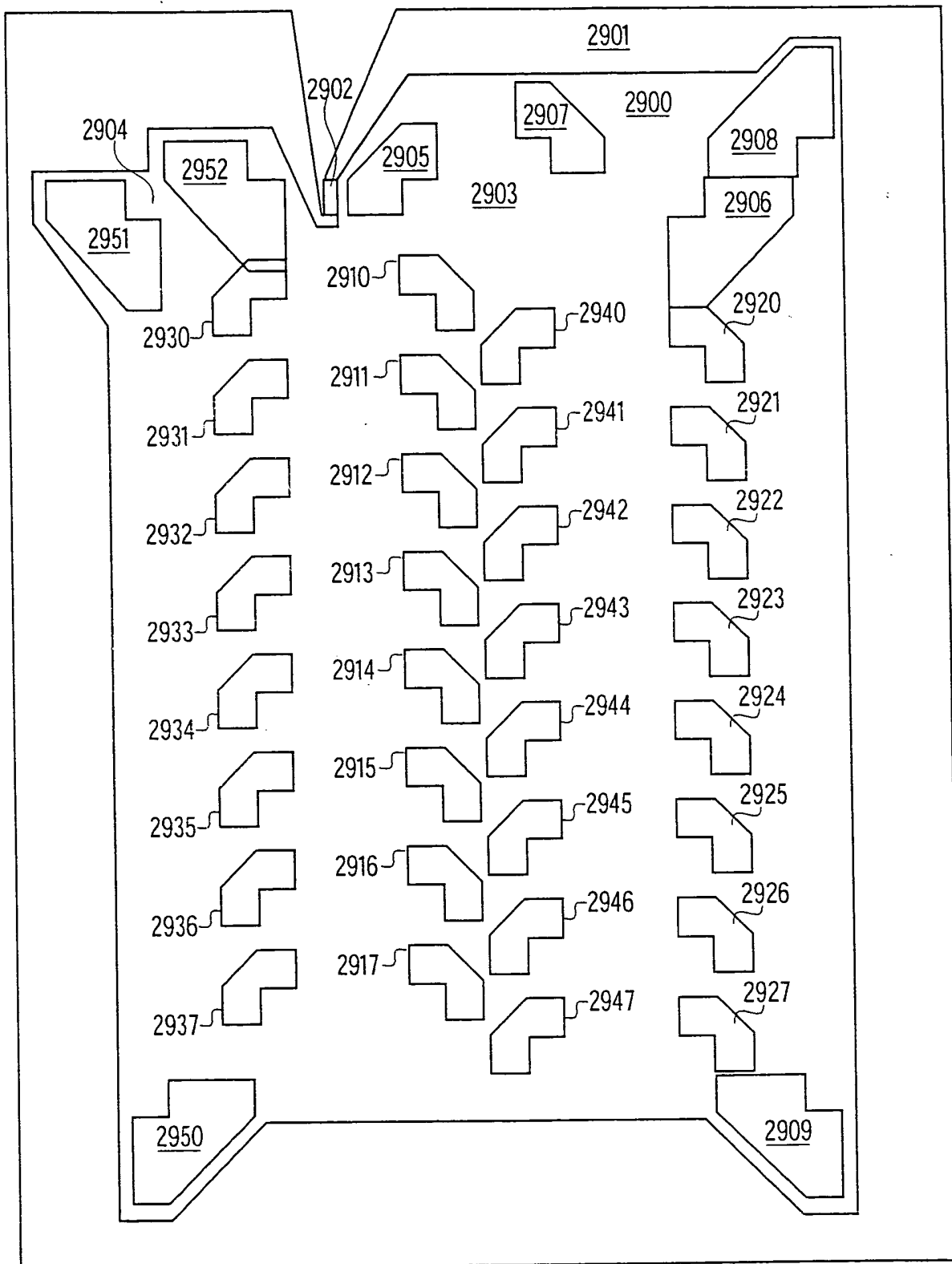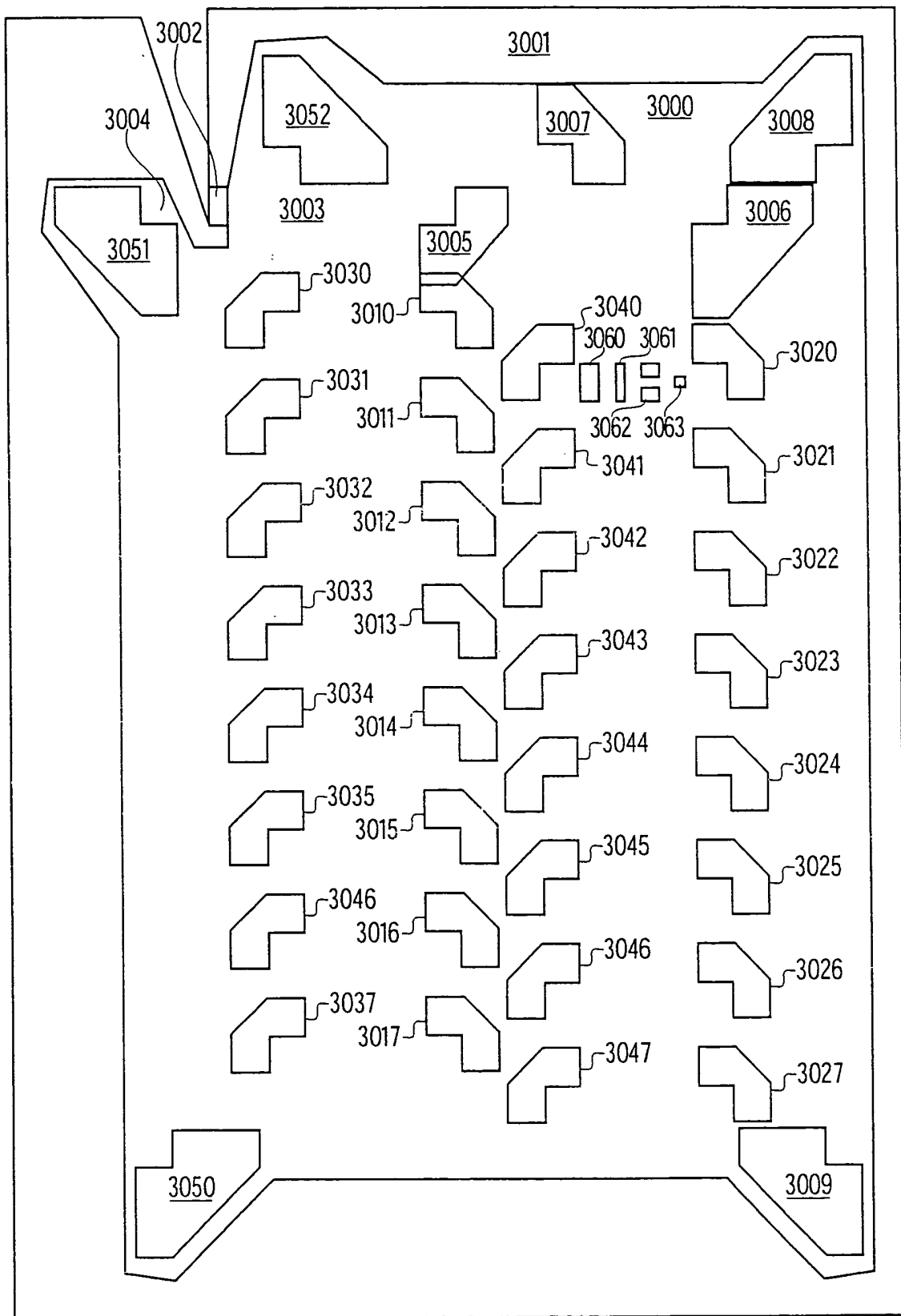
Tr2

Fig. 27

d

WZ

WX

Fig. 24

Primary path

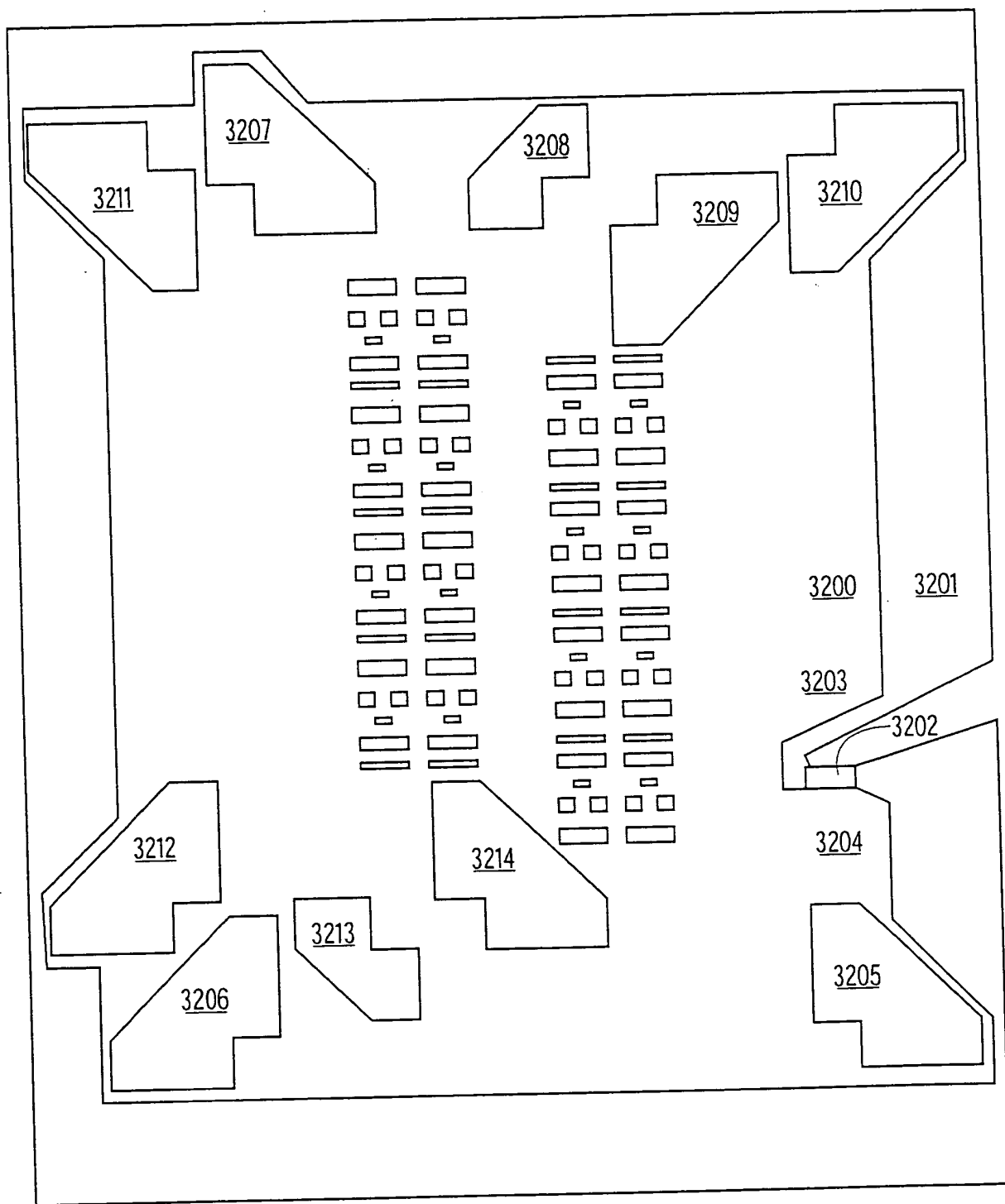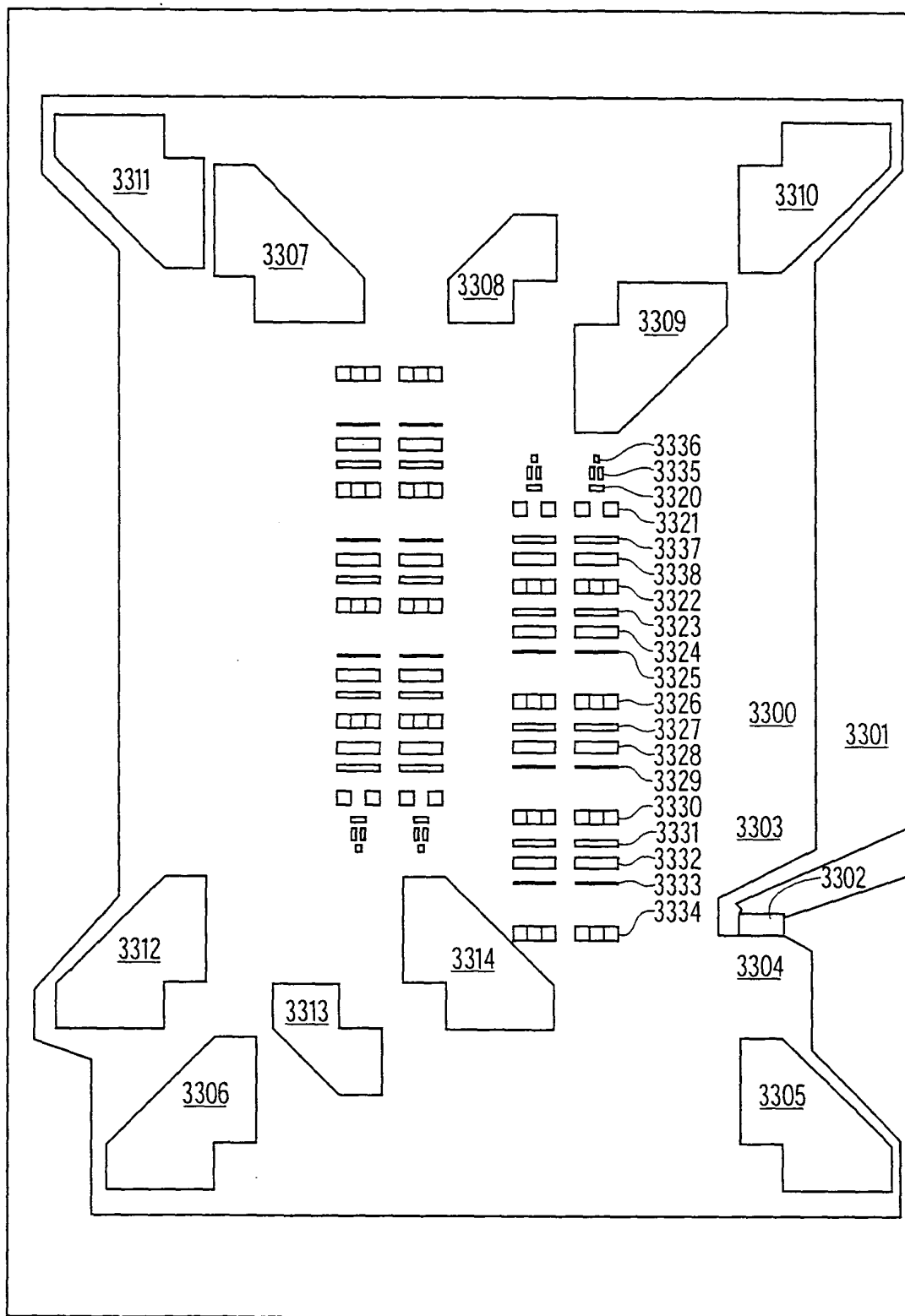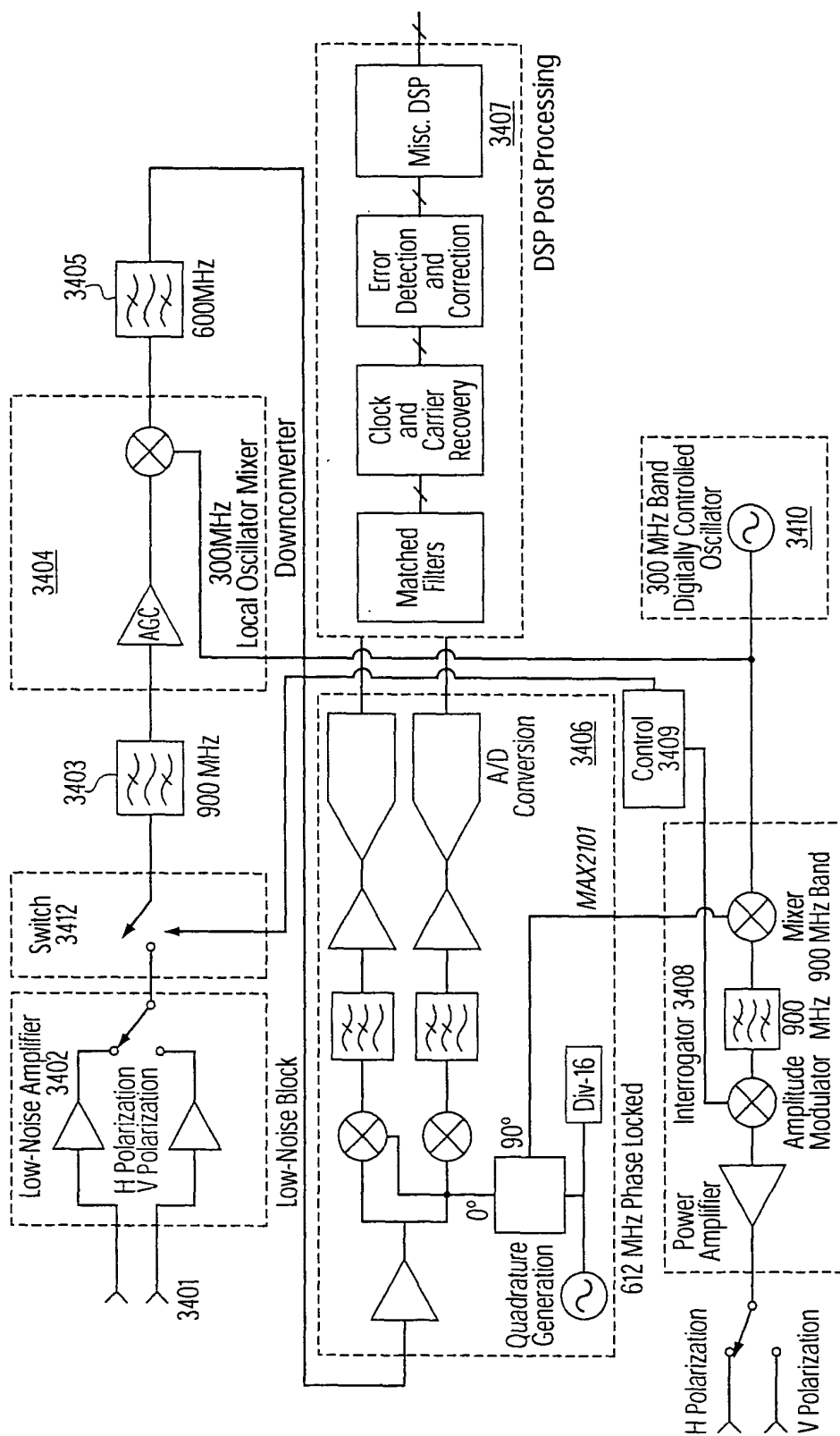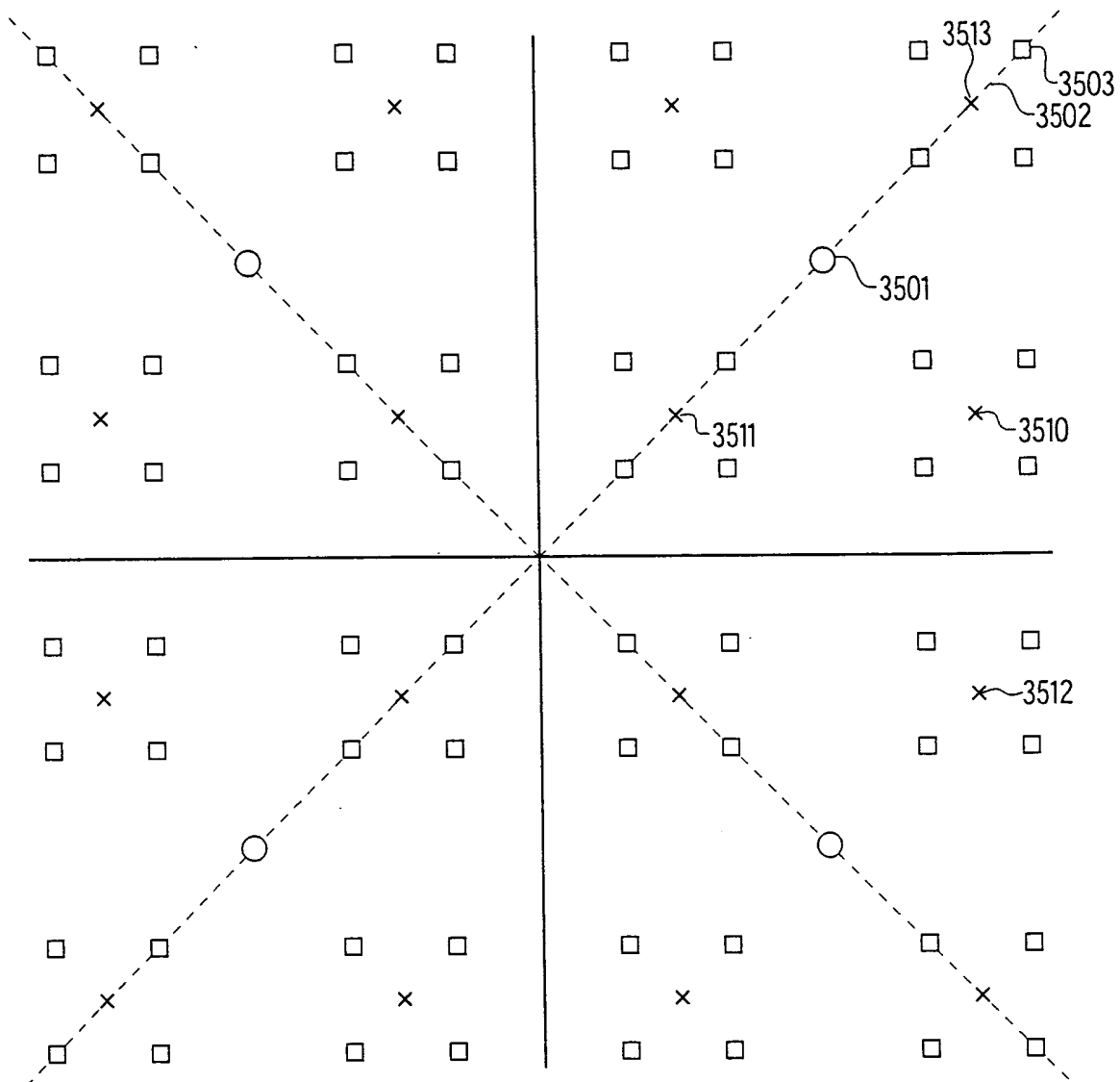2nd order paths
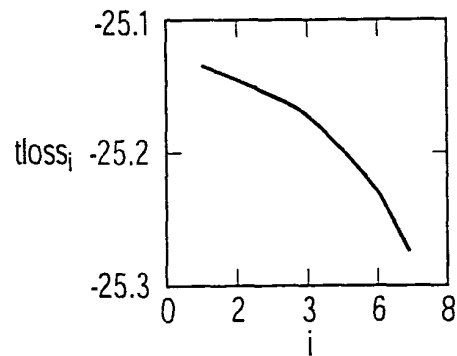
Fig. 26

Fig. 28

Fig. 29

Fig. 30
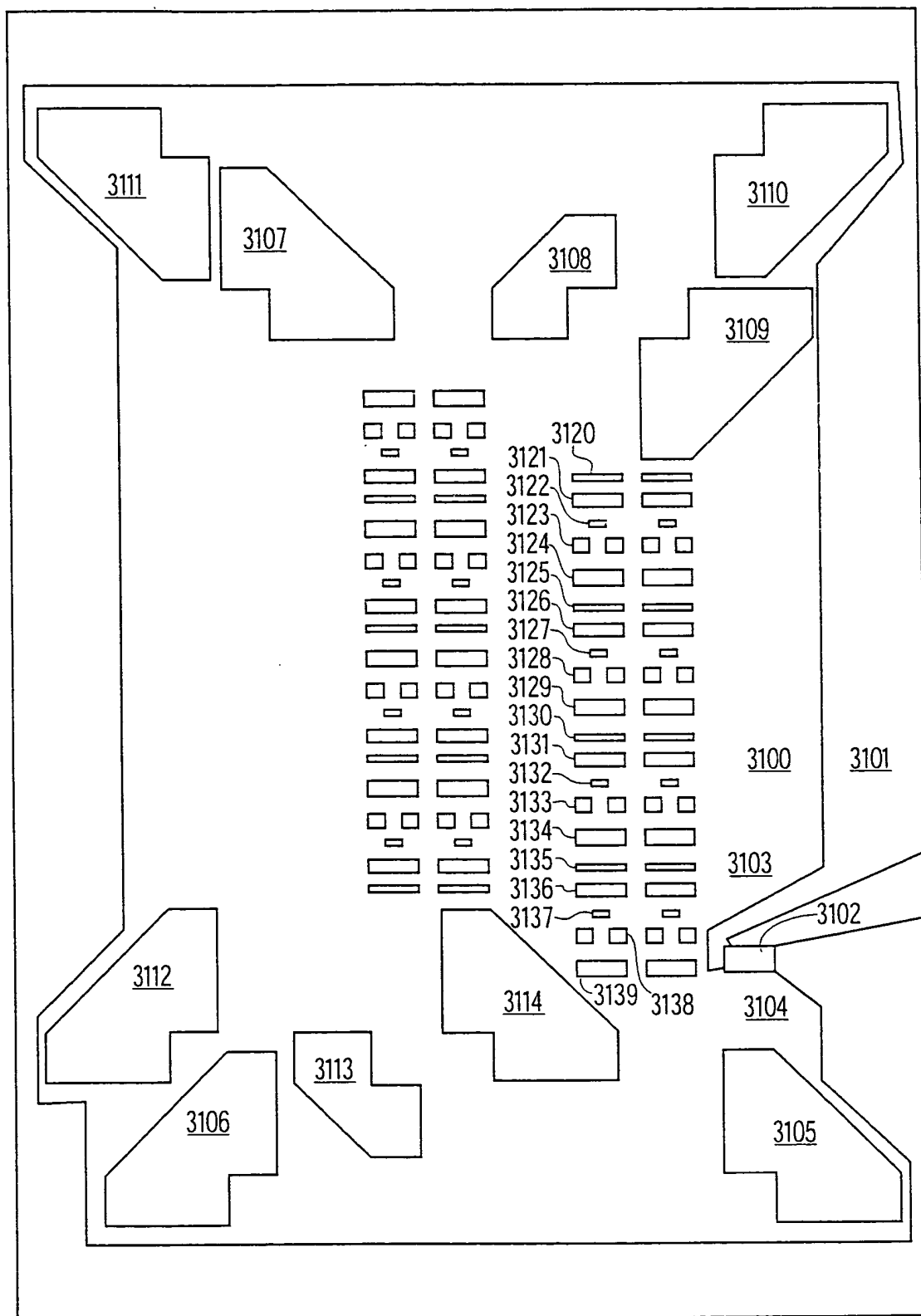
Fig. 31

Fig. 32

Fig. 33

Fig. 34

QAM-64

Fig. 35A

Phase Splitting

Fig. 35B

$\frac{\pi}{2}$	+	+	−	−
$\frac{\pi}{4}$	+	−	+	−
result	3510	3511	3512	3513